5. DESIGN GUIDELINES

This chapter provides specific design guidelines and standards to ensure that bikeway facilities developed along the SR-89 Cascade to Rubicon Bay corridor are constructed to a consistent set of the highest and best standards currently available in the United States. Ultimately, such bikeway facilities must be designed to meet both the operational needs of motor vehicles and the safety of bikeway users. The challenge is to find ways of accommodating both types of uses without compromising safety or functionality.

Planning, design, and implementation standards in this document are derived from the following sources:

- California Department of Transportation (Caltrans), Highway Design Manual, Chapter 1000: Bikeway Planning and Design, 2001.
- American Association of State Highway and Transportation Officials (AASHTO), A Policy on Geometric Design of Highways and Streets, 1994.
- AASHTO, Guide for the Development of Bicycle Facilities, 1999.
- U.S. Department of Transportation (USDOT), Federal Highway Administration (FHA), Manual of Uniform Traffic Control Devices (MUTCD), 2000.
- USDOT, FHWA, Selecting Roadway Design Treatments to Accommodate Bicycles, 1994.
- USDOT, FHWA, Conflicts on Multiple-Use Trails: Synthesis of the Literature and State of the Practice, 1994.
- Institute of Transportation Engineers (ITE), Design and Safety of Pedestrian Facilities, 1994.

Except for Caltrans guidelines for bikeways, all design guidelines must be considered as simply design resources, to be supplemented by the professional judgments of the designers and engineers.

BIKEWAY DESIGN GUIDELINES

The California Department of Transportation (Caltrans) has developed specific design guidelines in the Highway Design Manual for bikeways, including bike paths, bike lanes, and bike routes. Off-street portions of the SR-89 bikeway concepts should be designed to Class I bikeway standards wherever possible. According to Caltrans, a Class I bikeway (bike path) provides a completely separated right-of-way for the exclusive use of bicycles and pedestrians with cross-flow minimized.

For on-road portions of the identified SR-89 bikeway concepts, Class II bike lanes are not envisioned, for the reasons discussed in chapters 3 and 4. For the On-Highway Bikeway, four foot

shoulders are recommended where possible. For the Off-Highway Bikeway, a signed Class III bike routes on the residential streets is proposed.

Caltrans standards are intended to be a guide to engineers in their exercise of sound judgment in the design of projects. Design standards should meet or exceed the Caltrans standards to the maximum extent feasible. Lower standards may be used "when such use best satisfies the concerns of a given situation." Mandatory design standards, identified with the word "shall," are those considered most essential to achievement of overall design objectives. Advisory standards, identified with the word "should," are important but allow for greater flexibility. Permissive standards are identified by the words "should" or "may," and can be applied at the discretion of the project engineer. Designs which deviate from the mandatory Caltrans design standards shall be approved by the Chief of the Office of Project Planning and Design, or by delegated Project Development Coordinators.

The following section establishes the basic design parameters for Class I bikeways (paved multi-use trails) as developed by Caltrans. Mandatory standards are shown in italics.

MULTI-USE PATH STANDARDS

RECOMMENDED WIDTH

The recommended minimum width for Class I paved multi-use trails in California is eight feet, with two feet of lateral clearance and eight feet of vertical clearance. If the trail is projected to have high volumes of bicyclists, or if maintenance vehicles will be using the trail on a regular basis, a minimum width of 12 feet is preferred with the same lateral and vertical clearances. If possible, three-foot-wide unpaved shoulders with a compacted surface (often decomposed granite) should be located on each side of the paved surface to accommodate joggers and others who prefer a softer surface. In environmental sensitive areas of the corridor such as wetlands or SEZs (discussed below), design exceptions should be considered to reduce bike path shoulder widths to limit earthwork and vegetation clearing. **Figure 5-1** illustrates a typical Class I bike path cross section.

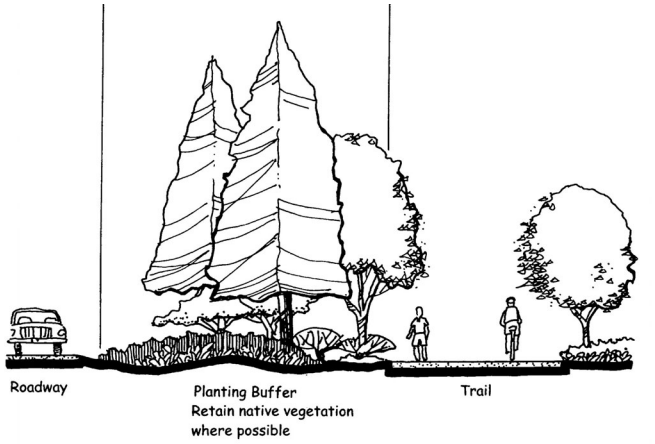
STRIPING & STENCILS

A yellow centerline stripe may be desirable (but is not required) on sections of the trail that have heavy usage, curves with restricted sight lines at approaches to intersections, and/or where nighttime riding is expected. Recommended pavement markings can be derived directly from the Caltrans Highway Design Manual (Chapter 1000) and the MUTCD.

BIKE PATH-ROADWAY INTERFACES

Several proposed segments of the Off-Highway Bikeway would involve a Class I bike path parallel to SR-89. Providing a separation between the bike path and highway is important for both user safety and to provide a more enjoyable recreational experience. The type and width of separation (from the roadway) provided for trails paralleling roadways will vary dependent upon site-specific conditions, such as available right-of-way, type of vegetation along the roadway, and potential environmental impacts related to sensitive habitat, wetlands, or SEZs. In general, the higher the traffic speeds, the greater the separation desired. Native vegetation and existing features (rock outcroppings, rolling topography) should be used whenever possible and supplemented by additional landscape screening and buffering to promote a more enjoyable and safer user experience.

Vegetation Buffer Between Bike Path and Roadway



Roadway crossings represent one of the key obstacles to trail implementation. Motorists are often not expecting to see bicyclists and pedestrians at unprotected locations. In general, trail crossings should occur at established pedestrian crossings wherever possible, or at locations completely away from the influence of intersections. Mid-block crossings should address right-of-way for the motorist and trail user through use of Yield or Stop signs, or traffic signals that can be activated by trail users. Trail approaches at intersections should always have Stop or Yield signs to minimize conflicts with autos. Bike Crossing stencils may be placed in advance of trail crossings to alert motorists. Ramps should be placed on sidewalk curbs for bicyclists.

The identified Class I segments of the Off-Highway bikeway would involve relatively few roadway crossings along its alignment, all of which would occur as the trail passed north-south through the Paradise Flat area parallel to SR-89. The private roadways that intersect the east side of SR-89 in this area – One Ring, Two Ring, Three Ring and Four Ring Roads – provide access to a cluster of residences near the Lake. Traffic on these roads is limited to local landowners only. Despite the low volume of traffic, when considering a proposed off-street bike path and required at-grade crossings of roadways, it is important to remember two items: 1) trail users will be enjoying an auto-free experience and may enter into an intersection unexpectedly; and 2) motorists may not anticipate bicyclists riding out from a perpendicular trail into the roadway. However, it is expected that these at-grade trail crossings can be properly designed to a reasonable degree of safety and to meet existing traffic engineering standards.

Given the low traffic volumes, uncontrolled crossings (unsignalized, but with other traffic control devices) are appropriate for the Ring Roads. Crosswalks and warning signs ("Bike Xing") should be provided for motorists, and STOP signs and slowing techniques (bollards/geometry) used on the trail approach. Care should be taken to keep vegetation and other obstacles out of the view line for motorists and trail users. **Figure 5-2** illustrates a typical unprotected trail crossing.